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HISTORY OF THE PLOW

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Early History

The history of the plow goes back to the very earliest times - not originally the implement now called a plow, but what answered the purpose centuries ago. Many writers have attempted to outline the history of this implement, but all accounts are more or less incomplete. It is, therefore, impossible to describe all the steps taken by the many inventors who have had a part in producing the plow as we know it today, but some of the more important ones are mentioned herein, together with the sources from which the data are taken.

According to Martell, (8, pp.216-222) ^{1/} the history of the plow dates back nearly to the beginning of tillage of any sort, although it was then an implement of the most primitive form. According to the writer just mentioned it is probable that the plow reached Greece from ancient Egypt, where it received certain technical improvements. Illustrations of early plows show that they were "made wholly of the natural crooks of the branch of a tree, the only artificial contrivances being the brace which strengthens the share, and the pins in the forcpart of the beam," (10, p.390) which served as a hitch (5,p.132).

The first so-called plows were operated by man power - one man or more pulling, and another man forcing the rooting projection into the ground (16, p.15). How long this type of implement was used is unknown, but after the discovery of metals they were utilized to cover the wearing parts (16, p. 116). The old Roman plow, as described by Virgil, had a point made of two pieces of wood meeting at an acute angle, and being plated with iron. It may be inferred from other writers (16, p.116-117) that the early plows inverted the soil, even if they did not turn furrows as farmers of the present day understand plowing. For many centuries little or no improvement was made in this tillage implement. The Dutch are said to have made the first real improvement over the Roman plow. W.E. Taylor (16, p.117-118) states that "the moldboard of the Dutch plow was given a more perfect shape, and was covered with sheets or strips of iron".

^{1/} Underlined numbers in parenthesis refer to citations on
pages 15 and 16.

It would seem from Martell's article (8) that the early wooden plow had no moldboard, but according to one authority the late Greek plow had an iron plow share. Plinius speaks of a "cultur", which appears to be quite similar to our knife colter. He also described three other kinds of plow-shares, each of which was designed for use in a particular type of soil. The Romans also made use of moldboards. Their plows were made light or heavy according to the soil in which they were to be used. The Roman plow was seldom drawn by horses. Bullocks or oxen were preferred in heavy ground, and cows in light soil. One writer states that "Until 1631 the barbarous custom of fastening draught cattle to plows by their tails was practiced." It was a Roman custom to go over a field three times, first with the colter, and then with the co-called plow. In the first plowing the furrows ran lengthwise, in the second crosswise, while with the third plowing the seed was sown. With the decline of Roman agriculture the Roman plow was taken over by the ancient Germans, who made few, if any improvements in it. Plows having a simple fore carriage and a wooden moldboard were in use in northern Germany as late as 1860.

The report of the Board of Judges of the New York State Agricultural Society (10, p.395) illustrates a plow having two wheels to keep it steady in the furrow, and a colter of modern form. This illustration is said to have been taken from an old Saxon calendar which was preserved in manuscripts of the eleventh century, and the plow is said to have been used in the time of William, the Conqueror. It was drawn by four oxen, and was fastened to them by ropes or twisted willows, and sometimes of whale skin. The plow was a "wooden wedge, covered with straps of iron, one side being placed parallel to the line of the plow's direction, the other sweeping over to the left-hand clearing it from its own path, and leaving an unobstructed furrow for the next slice". Inserted in the beam was a colter quite similar to the modern type, while the depth was regulated by a wheel placed in front.

Early European Plows

A plow generally known as the Rotherham plow was materially improved about 1760 by a Scotchman, named James Small. The origin of this implement has been disputed, some writers crediting Walter Blith as the inventor, while others have named other inventors (8). However, in a book by J.B. Passmore (12, p.14) is the following statement:- "The beginning of a new era in plow design is marked by the patenting of the Rotherham plough by Stanyforth and Foljambe in 1730". 2/ This implement is described as a "swing plow, small and light, and made of wood throughout, except for an iron hake, and the colter and the shares. It carries a winding moldboard, plated with iron, but its novelty consisted in a different arrangement of the parts of the frame" (12, p.14). The last mentioned author further states that the Rotherham plow was copied by James Small, who introduced a modified form of it into Scotland about 1767. The 1860 Census (20), records the importation and use by George Washington of one of the Rotherham plows. The same authority relates that "the making of the first iron plow has been attributed to William Allon a farmer of Lanarkshire, in Scotland; in 1804, but an iron plow was presented to the Society of Arts, in London, as early as 1773 by a Mr. Brand." J.B.

2/ Some authorities give 1720 as the date of this invention.

Passmore, already mentioned (12) is authority for the statement that a Suffolk blacksmith, named Brand, is reported to have been making iron plows in 1766.

In the 1860 Census (20, p. xvii) appears the following statement: "It is said that Sir Robert Peel, in 1835, having presented a farmers' club with two iron plows of the best construction, found on his next visit the old plows with wooden moldboards again at work. 'Sir' said a member, 'we tried the iron, and be all of one mind, that they make the weeds grow.'" Charles Newbold, the American inventor, met with the same difficulty while attempting to introduce his cast iron plows in the United States, 'the farmers declaring that iron plows poisoned the soil, and prevented the growth of crops.' "

Published accounts by English writers late in the 18th century appear to have aroused the people of the continent to the desirability of improving the plows used by them. The technical and economical advancement of agriculture was, however, halted for a time by the Napoleonic wars. One of the objects sought later in the making of plows was a moldboard so shaped that with the minimum amount of power exerted the earth would be turned over, and come into contact with the air. Iron was substituted for many parts of the plow that had formerly been made of wood. In Germany the use of iron as the main material in plow construction goes back to about the middle of the 19th century. Bailey and Lummis are said to have been the first inventors to apply mathematical principles to plow construction. Lummis built such a plow about 1730, and applied for a patent.

Robert L. Ardrey (1, p.6) states that "the first English patent granted on a plow was to Joseph Foljambe, of Yorkshire, in 1720, he having invented a number of improvements on crude style of plow which had been brought from Holland." (The Foljambe and the Rotherham plow are supposedly the same.) "The bottom of Foljambe's plow was of wood, with a sheet iron covering on the wearing parts, and had a point of iron plate. The colter was of course of iron. The point was conical in form", and so far as the records show, it is believed to have been one of the earliest plows to pulverize the soil, and also to have been the first plow on which a clevis was used. Martell (8) states that the Small plows were particularly favored in England, and that Albrecht Thaer, the founder of scientific agriculture in Germany, made strenuous efforts to have them put into use in Germany. Another plow that found favor with English farmers was one known as the Howard plow. In this implement the share and moldboard were well proportioned, and the bottom could be easily reversed (8) Ardrey (1, p.8) states that another English plow deserving mention was the Ransome, named from its inventor, Robert Ransome. This inventor obtained a patent in 1785 for making the share of cast iron, and another in 1803 for chilling the share.

According to Martell (8) only limited information is available regarding the plows used in France in the early days. In the South of France the so-called Bonnet plow, made mainly of wood, was extensively used, while in other sections the Brabant plow seems to have been the most popular.

Early in the nineteenth century (8) the attention of German agriculturists was called to the importance of the improved English plows, but as a class they were slow to adopt the use of scientifically built plows. Improvements on the English, Flemish, and Brabant plows were made by German inventors. The improved Brabant plow became known in Germany as the Hohenheim plow, and was used extensively. This plow had a very long wooden beam, but one handle, and a short moldboard with a deep spiral curve behind. A plow built by Knoke, and known as the Magdeberg - a wheel plow with a broad bottom and very long beam -- was used extensively about 1850.

In Austria the Kleyle plow, designed by Ministerial Councillor von Kleyle and having a peculiarly shaped spiral moldboard, was much in demand. "The German plows exhibited more or less variation according to the region and the nature of the land. Thus the French plow in the district around Beyreuth had a narrow, straight lined, extremely long moldboard which formed almost a right angle with the share." (8).

The Bollweiler plow was extensively used in Austria about 1850. This plow is said to have displaced the French plow to some extent in Lorraine. "Among the German double plows the Bavarian and Austrian Leiten plow is particularly worth mentioning. The two plowbodies stand at a right angle to each other. During the work one of the plow bodies stands out horizontally on the right. Although the work of this plow was pronounced satisfactory, still it seems never to have made its way." (8)

The Ruchadlo or Bohemian pivot plow was invented in 1828 by Vavverka Brothers in Bohemia and became well known in Germany. This plow had a jutting moldboard, the narrow back edge of which was bent horizontally so as to take the part of a share. In some respects this plow resembled the Brabant plow of France. The soil was stirred rather than turned over. "The share and moldboard were made in one piece." (8)

The hoe plow or secha - a plow having the working parts split into two tines - was used in some parts of Russia and Poland. It was introduced into Sweden by Finnish emigrants about 1762. The simplest sechas have two tines, but others have added pieces forming rudimentary moldboards. There are also other variations, such as a moldboard in the middle, and a moldboard attached to the plow beam. (8)

Plows of the American Colonies

According to A.B. Allen's description of the early plows used in the United States (9) the early settlers in this country had very crude implements. Mr. Allen states: "A winding tree was cut down, and a moldboard hewed from it, with the grain of the timber running so nearly along its shape as it could well be obtained. Onto this moldboard, to prevent its wearing out too rapidly, were nailed the blade of an old hoe, then straps of iron, or wornout horseshoes. The landside was of wood, its base and side shod with thin plates of iron. The share was of iron, with a hardened steel point. The colter was tolerably well made of iron, steel edged, and locked into the share nearly as it does in the improved lock colter plow of the present day

(1846). ***** The beam was usually a straight stick. The handles, like the moldboard, split from the crooked trunk of a tree, or as often cut from its branches; the crooked roots of the white ash were the most favored timber for plow handles in the northern states."

A Colonial plow deserving mention is one known as the Cary plow. This implement is described in the 1860 Census (20, pp. xvii and xviii), as having a wrought-iron share, and wooden landside, standard, and moldboard plated over with sheet-iron or tin, and having short upright handles. The 1899 Yearbook of the United States Department of Agriculture, (19, p.315) referring to an implement known as the "Old Colony" plow generally in use in the United States about 1820, states: "It had a 10-foot beam and a 4-foot land side; your furrows stand up like the ribs of a lean horse in the month of March. A lazy plowman may sit on the beam and count every bout of his day's work."

"Plows having the beams supported by two wheels ***** were made by the Greeks 2,000 years ago. The coulter was certainly known in the time of William the Conqueror, in the eleventh century, in England, if not earlier, for we read that at that time plows with their beams supported on wheels were very common." (1, p.6).

American Developments

Among the many important discoveries and inventions in the United States may be mentioned the following: It has been stated that "The discovery of Mr. Jefferson (Thomas Jefferson, the third President of the United States) by which moldboards could be made by anyone with the absolute certainty of having them all exactly alike, was an era in agriculture, and the root of all real progress in the manufacture of this all-important implement" (10, pp. 402-403). Prior to this discovery one great difficulty in the construction of plows was the fact that ordinarily a farmer purchased the wooden parts of his plow of a mechanic called a "plow-wright," and had the iron parts put on by a blacksmith. As there appears to have been little, if any, agreement between the mechanic and the blacksmith in the making of the parts and finishing the plow the resulting implement was often far from satisfactory to the farmer.

Charles Newbold, of New Jersey, the inventor of the first cast iron plow made in America, in 1797 obtained the first patent issued in this country for a plow (20, p. xviii). In his specifications of the plow, Ardrey (1, p.9) states: "The plow to be (excepting the handles and beam) was to be of solid cast iron, consisting of a bar, sheath and mouldplate." Although Newbold's plow worked well, it was not accepted by the farmers, as they claimed the iron poisoned the land, and made the weeds grow.

The next patents were issued in February and June, 1804, to Hezekiah Harris of Kentucky and John Denver of Maryland, respectively. Definite information regarding these plows is not available. David Peacock of New Jersey obtained a patent for a plow in April, 1807, which so closely resembled the Newbold plow that Mr. Newbold sued him for an infringement on his

patent. One difference in the two plows was that the Newbold plow was cast in a single piece, while the Peacock plow was cast in three pieces. Peacock made some changes in his plow and obtained another patent in 1822. The most outstanding improvement perhaps was the lock colter, which it is believed he was the first to introduce. The Peacock plows seem to have found wide favor with the farmers, some of them having been found in use in New York, New Jersey and Pennsylvania as late as 1850 (10, p. 449).

While the first patent issued in this country for a cast iron plow was obtained by Charles Newbold in 1797, it is possible there was an earlier cast iron share. It was stated that "Colonel John Smith produced the model of a plow share according to which it was projected to have that utensil made of cast iron, in order to save expense in husbandry, and come cheaper to farmers than those in common use, forged from wrought iron (14, p.vi). No record of a patent, however, on this proposed plow has been found. The 1860 report of the Bureau of the Census (20, p.xviii) states that Robert Smith, of Pennsylvania, in May, 1800, "took out the first patent for the mouldboard alone of a plow. It was of cast iron, and of improved form, the principles of which were published by him." It is possible a patent was obtained by Colonel John Smith for his invention, the record of which may have been destroyed in the Patent Office fire of 1836.

According to (20, p. xvii) Jethro Wood, of Scipio, New York, was granted a patent for a cast iron plow in July, 1814. In the Wood plow the mouldplate, share and landside were cast in three parts. "The mould-plate combined the mechanical principles of the wedge and screw in raising and inverting the furrow slice, it became the foundation of many patented improvements of later date." In September, 1819, Mr. Wood obtained another patent which was renewed by Act of Congress in 1832. While "cast iron was substituted for the wooden mouldboard, landside and standard, and a cast iron point or share for the old wrought, steel tipped share, the most important part of Wood's invention was the interchangeability of parts." (1, p.9) which made it possible for a farmer to replace a broken or worn part with a new one. Wood "also sought to form his moldboard on scientific principles so that the pressure of the turning furrow would be evenly distributed on its surface and thus avoid wearing it in spots." One writer states that Wood "whittled away bushels of potatoes before he was able to bring out a miniature form of a plow that suited him. Large potatoes were whittled into almost every conceivable form before the present and efficient curve of the moldboard was attained." Mr. Wood was "upbraided with the taunting epithet of a whittling Yankee." After Mr. Wood had "made his patterns for having the different parts of the plow cast, he encountered almost insurmountable difficulty as the workmen who performed the molding were disobliging and were filled with prejudice against such inventions, so that Mr. Wood found it absolutely necessary to offer them a liberal bonus before he could induce them to attempt to mold these parts of the common plow that are molded, at the present day, in almost every village of the country, without the least difficulty" (17, pp. 241, 242). The Wood plow proved so satisfactory that there was a great demand for it, and unscrupulous parties attempted to copy it, regardless of his patent rights. William H. Seward, Secretary of State under Lincoln referring to the Wood plow, said: "No citizen of the United States has conferred greater economical benefits on

his country than Jethro Wood - none of her benefactors have been more inadequately rewarded." (1, pp. 9, 11) Ardrey is authority for the statement that "it was not long until cast iron plows were in general use, and for a generation or longer but little was done to improve his (the Wood) model, further than to make changes in detail, adapting it to the needs of different parts of the country."

The 1860 Census (20, p. xviii) records that about 1810 Josiah Ducher, of New York, began a "series of improvements in cast iron plows," patents for which were obtained in 1822. Other inventors who worked to make the cast iron plow easier of draft were A.L. and E.A. Stevens, of New Jersey, to whom patents were issued in 1821. One patent "was for hardening the cutting edges and parts exposed to wear by cold chilling them."

Leo Rogin (13, p. 25) states that "As for the Middle States, we have reliable evidence that as early as 1819 more than 600 of Wood's plows were sold in 40 days to farmers living within a radius of 30 miles from New York City."

Gideon Davis, of Maryland, is said to have received a patent for a plow in May, 1818. It is stated that this was "the first attempt since Jefferson's day to construct the moldboard on mathematical principles." Davis is believed to have been "the first to dispense with the perforation and consequently the weakening of the beam, in order to insert the colter. His plan of attaching it to the side was imperfect as compared with modern methods, but it was a step in the right direction (10, p. 462).

Another famous inventor was Joel Nourse, who in 1842 perfected the well known Eagle series of plows (1, p. 11). The Nourse plow had a longer moldboard than Wood's, with a greater turn, thereby breaking the furrows more thoroughly. The Nourse plows proved so popular that it is said between 25,000 and 30,000 plows were sold annually during the 1840's. Many inventors became interested in trying their hand at plow making, so that between 300 and 400 patents covering this implement were issued in the United States by the middle of the nineteenth century (20, p. xviii). An interesting fact in connection with the invention of the Nourse plow is that the inventor to more surely accomplish his purpose took a sheet of thick lead, and cut and hammered upon it until he brought it to the desired form (10, p. 473). The Eagle plow No. 2, finished in 1842 was made from the lead pattern. The other Eagle plows were worked out in wood, the theory being based on the Eagle No. 2 as the groundwork. It is said (20, p. xviii) that the firm of Ruggles, Nourse, Mason & Co., (of which Joel Nourse was a member) was able to supply plows of 150 different forms and sizes. Included in this large variety was a subsoil plow adapted to use with from one to six horses. It is said that the first implement of this kind in the United States was imported by the firm last mentioned in 1840 from Scotland, and that they later improved it, making it simpler, lighter, and cheaper in construction.

Among other American inventors in the early days were Stephen McCormick, to whom a patent for a plow was issued in 1819, while a later patent was obtained by him in 1826. C.H. McCormick also tried his hand at inventing plows, and obtained a patent for a hillside plow in June, 1831, and for a horizontal self-sharpening plow in November, 1833. The Stephen McCormick plows of cast

iron were manufactured and sold extensively throughout the South, approximately 6,000 having been manufactured in Rockbridge County, Va., between 1827 and 1837.

A very interesting account covering the plow invented by Daniel Webster in 1836 or 1837 was published by the New York State Agricultural Society (10, pp. 483-485). Webster was a firm believer in deep tillage, but in his day few, if any, plows were made that could turn a furrow more than five or six inches deep. He is said to have been very fond of farming and rural life, and specialized in raising fine cattle, particularly oxen. The plow invented by Webster is described as having been "twelve feet long from the bridge to the tip of the handles; the landside is four feet long; the bar and share are forged together; the moldboard is of wood plated with straps of iron; breadth at the heel of the moldboard to landside, eighteen inches; the spread of the moldboard was twenty-seven inches; the lower edge of the beam was two feet four inches above the sole; width of share fifteen inches." This plow was designed to work the soil from twelve to fourteen inches deep (10, p. 484). The beam was of white oak, sufficiently long and strong for four yokes (eight head) of his large oxen. It is said that when the plow was completed according to his directions - he having given personal attention to the building of it - he was the first man to use it; that he worked several hours with it, and was delighted to find it answered his purpose so admirably. This seems to be proven by the following expression credited to the inventor (5, p. 149) - "When I have hold of the handles of my big plow in such a field as this (a brush covered pasture) with four yokes of oxen to pull it through, and hear the roots crack and see the stumps all go under the furrow out of sight, and observe the clean, mellowed surface of the plowed land, I feel more enthusiasm over my achievement than comes from my encounters in public life in Washington."

It is stated that "Aaron Smith was the first to adopt two plows to work well together, one of which threw 2 or 3 inches of the surface into the bottom of the preceding furrow, and the other covered it with the lower earth" (10, p. 505). This is probably one of the early uses of the jointer. No date of this invention is shown.

Taylor (16, p. 121) gives an account of the Wiard plows. In 1800 Thomas Wiard constructed plows having wooden moldboards and cast iron points. He was succeeded by William Wiard, whose plows were made of cast iron, strongly built and well balanced. In 1865 Harry Wiard developed a process for hardening cast iron for moldboards and other wearing parts, but so far as is known he did not attempt to patent the process. Hard iron developed by Mr. Wiard, was used in the construction of plows in New York.

While the cast iron plows were far superior to the wooden plows of the very early days, still they left much to be desired. They were too rapid, as related by Leo Rogin (13, p. 31), and would not scour properly in the sticky, rich soils of the Mississippi Valley and the bottom lands of Ohio. Soon after the introduction of cast iron plows (1, p. 11) efforts were made to harden the wearing parts, thus making them more durable. Little progress was made in this direction, however, for a number of years, but in 1853 James Oliver began a series of experiments which led to the granting of a patent in 1868 for hardening cast iron (3, pp. 20-21), which improved both

the wearing and the scouring qualities of the iron plow. Oliver wanted a plow that would, to use his own words, "turn the soil with a singing sound" (11, p.3). The hardened share was far better than the cast iron share (16, p.122), but it was found that the rich and sticky soils clung to both the old and the new plows. They failed to turn the furrow. They "rooted, but would not invert, the soil." It is said (1, pp.11, 13) that when cast or "grey iron plows made after the patterns of Wood, Nourse, and others were first introduced no complaints were heard in regard to scouring." It was when the soil after repeated workings became dense and sticky that the cast iron plows would not scour satisfactorily. Oliver persevered in his efforts to produce a perfect chilled plow, at the same time working out several other improvements. Among those patented (1, p.13) may be listed the slotted handle brace used on plows adapted to either two or three horses. The same patent, issued in 1871, included "a share with a fin cast upon it extending upward from the landside edge of the point so as to cut the soil or sod." On June 18, 1872, another patent was issued to the same inventor for his "peculiar standard, by which the plow beam is brought more directly over the line of draft, the shin extending to the side past the landside edge of the beam. This patent also covered the peculiar Oliver wheel for a wood-beam plow, one arm of the standard being slotted to permit a vertical adjustment and the other arm flattened on its end and fitted under the beam where it is held by a hook in a way to permit alignment of the wheel when the beam is shifted.

It is stated (3, pp.20, 21) that on April 14, 1868, Oliver obtained a patent for a moldboard for plows, and on April 21 of the same year a patent for casting moldboards. His patent entitled "chill for casting moldboards" was issued February 2, 1869. Several other patents were obtained by Oliver between 1871 and 1876. Finally he discovered a way of "annealing the plow castings so that the soft portions became pliable enough to work out their strains from shrinkage in cooling without affecting the hardness of the chilled faces." A patent was taken out by Oliver in November, 1873, covering "a share with a colter or shin cast as a part of it, to be seated against the front edge of the moldboard, and also the sloping landside" (1, p.13). A patent issued to Oliver in July, 1879, and several later ones covered the process of "chilling the nose and the cutting edge of the share" (1, p.13) thus permitting the inventor to realize his ambition for a plow that "sang". It is stated (1, p.14) that "an important patent" was taken out by Oliver in May, 1877, for a jointer or colter holder. "It covered a holder rigidly secured to the standard of the plow, and having a slotted plate fitting the underside of the beam, to which it was held, as well as a slotted arm extending downward, to which the jointer or hanging colter blade is attached".

With the opening up for settlement of the vast tracts of land now known as the Great Plains area came a demand for a plow that would scour better than those then in use. To meet this demand John Deere, a blacksmith, began experimenting. Taylor (16, p.122) tells of the plow built by Deere in 1837, in which a sawblade was used for covering the moldboard. Trials proved that the steel-covered plow worked well, and that "the black soil did not stick to it so tightly". The difficulty was to obtain suitable steel (1, p.16). At first old saws were gathered and used. Following this saw blanks were purchased, after which steel was imported. J.M. Swank (15, p.390)

stated that "The first slab of cast plow steel ever rolled in the United States was rolled by William Woods in 1846, and shipped to John Deere." "The manufacture of steel for plows used on the prairies of the West was revolutionized in 1868 by the invention of soft center steel for moldboards, shares and landsides" (1, p.16).

According to Ardrey (1, pp. 14, 16) "The first steel plow of which there is any record, was made in 1833, in Chicago," the maker of which was John Lane. In constructing this plow an old saw, probably a crosscut, had been cut into pieces of which three with the teeth removed, had been used for the moldboard.

A patent was obtained by William Morrison in 1862, (1, pp. 16, 18) which covered "the use of a cast steel plate for the face of a moldboard, share or landside, welded upon and strengthened by a backing plate of soft iron." The great difficulty with this was that in tempering the steel "the iron and steel would not expand and contract together" without a great deal of trouble.

In September, 1868, John Lane, Jr., son of the before-mentioned inventor of the steel plow, obtained a patent for a soft center steel for moldboards which consisted of three layers, the two outer ones being of steel and the inner one of soft iron or steel. It was found that a moldboard or other shape made in this way would not warp enough to injure the scouring or turning qualities of the plow, as one steel plate balanced the other, and the soft plate between them gave added strength to the combination. This was an extremely valuable invention worth, some writers have said, "millions (of dollars) annually to the farmers of the West" (1, p.18).

So many patents were issued for sulky and gang plows that only a few can be mentioned here. Perhaps the first patent covering a gang plow was issued to H. Brown, in 1844, and the second to E. Goldthwait, in 1851 (1, p.19). Other early patentees were C.R. Brinckerhoff, M. Turley and F.S. Davenport. "One of the first sulky plows to be made practical for **** general use is said to have been" the Davenport, based on patents issued to F.S. Davenport in 1864 for a gang plow. In 1864 Robert Newton "converted one of Davenport's gangs into a 3-horse plow, with one 16-inch base, a 3-horse evener and rolling colter." He made a number of improvements, including changing the position of the tongue, putting it between the land horses. He is said to have sold 26 sulky plows in 1865 in Illinois. By 1868 a number of practical sulky plows were on the market. In 1875 "a patent was granted to Gilpin Moore on a sulky that became widely known." On May 2, 1876, a patent was issued by W.L. Cassady, covering a sulky plow (1, p.20). This patent was re-issued in 1877. This is said to have been "the first sulky to dispense with the landside, and to use a wheel set at an angle against the furrow to support the plow." In 1884 the first of the 3-wheel plows, based on patents issued to G.W. Hunt, were introduced. By 1880 sulkies were in common use, according to Lee Rogin (13, p.50), although single walking plows, usually drawn by three horses, remained in favor in the Mississippi Valley through the 1880's.

For "breaking", as the first plowing of the western prairies was called in the 1840's, extremely heavy wooden implements known as "prairie breakers" were used (13, pp.45-50). Owing to the extremely heavy mat of grass and other roots the prairie sod was very tough and hard to cut, which necessitated the use of strong, heavy plows. The prairie breaker was a "wheel plow, i.e., with the front end of the long heavy beam resting on a ponderous two-wheeled truck, one large wheel to run in the furrow, and the smaller one to run on top of the sod." They are designed "to turn over flat, extremely shallow furrows, and were always provided with a colter to cut the sod." It is said that four to six yoke of oxen were frequently used in pulling these heavy plows, and some writers have mentioned as many as twelve yoke. Toward the middle of the 19th century the heavy wooden breakers were to some extent superseded by a plow known as the "rod breaker," that is, a plow having narrow curved iron rods in place of the wooden moldboard. Steel breakers, which came into use about the time the steel plow became popular, made it possible for a settler who wanted to do his own breaking to use a much smaller power unit, usually horses because of their more rapid gait. However, the heavy wooden plows, drawn by oxen, continued to be used to some extent through the sixties.

Before the Civil War F.A. Michaux, an eminent botanist of his day, stated that in some parts of the South "the major part of the planters employed slaves to drag the plow." In some parts of the South the hoe was more generally used than a plow as late as the middle of the last century. One writer states that the hoe "was made to do the work of pick, spade, shovel and plow", even being used sometimes to dig a grave. On many plantations the land was said to have been "entirely prepared for the crop by chopping with the hoe," instead of plowing (13, pp.52-53).

One writer states (13, pp.53-56), "With the exception noted (in the coastal region of South Carolina and Georgia) the shovel plow, drawn by one horse or mule, was in almost universal use throughout the South during the era of the wooden plow in the North, and it continued to be used to a lesser or greater extent in all the slave States until the outbreak of the Civil War, and for some years after." A traveler through North and South Carolina and Georgia in the early forties gives the following description of this plow: "It is made of wrought iron in the shape of the blade of an Irish shovel, with a loop on the backside for the stock to enter. They are generally made by the blacksmith on the plantation where they are used. The operation is to draw them through the ground with one horse or mule, the plowman holding them in an upright position, throwing the dirt both ways, mostly to the right hand, or furrow side of the work. It is pretty much like dragging a cat by the tail."

Virginia is said to have been "the first of the Southern States to introduce improved plows," also that "before the close of the second decade of the nineteenth century there were no moldboard plows on the far greater number of farms in the lower and middle regions of that State." (13, p.54)

"A survey of Virginia agriculture for 1842 revealed that Freeborn's cast iron plows were in general use" in portions of the State, and that "great progress had been made in the matter of plows throughout the State

during the preceding twenty years. The cast iron implements specially manufactured in the North for the Southern trade were ***** a great improvement on the shovel plow." (13, p.55).

It seems that in the Gulf States the cast iron plow was still a revolutionary innovation in the early fifties. One writer referring to Louisiana about 1850, stated that "there exists a foolish prejudice amongst us, against plows with cast moldboard and point." It is recorded that "as late as 1866 the old wooden moldboard, iron-strapped plow was the common implement in the Delta region." ***** "Wooden moldboard Cared plows have been used here (Alabama) in black soil, under the impression that no other plow would turn the soil " (13, p.56).

R.C. Ingersoll (7, pp.172-175) gives the following information relative to disk plows:

The first patent obtained in the United States for a disk plow was granted to George Page, of Washington, D.C., in 1847. This is said "to have laid the foundation on which is built the modern disk tillage implement." This patentee made a "revolving moldboard for a plow. He used a regular share, landside and colter, with a moldboard revolving on a pivot at its center and set at an angle to the line of draft. Its rear landward side was supported against the pressure of the soil by a roller made adjustable to that the angle of the moldboard might be changed.

"In 1856 and 1858 B.C. Hoyt patented a rotary cultivator plow of the disk moldboard type, but had another disk bolted to the cutting disk with teeth, which would turn in the furrow and cause the moldboard disk to rotate. A device for adjusting the moldboards vertically was also provided to regulate the width of the furrow turned."

In 1868 J.S. Godfrey "made a gang plow of the concave moldboard type, with revolving scrapers." It is believed that these three inventions "practically cover the development of the revolving disk moldboard type of plow."

The first patent found of a "purely disk plow was issued in 1867 to J.M. Cravath. "He had gangs of three solid disks, but there was no way of taking the side thrust, and it was therefore impracticable". It is not known whether or not any of these disks were manufactured for sale, but at any rate "it was a basic patent of the disk type of plow, that is, without the shares or moldboard."

"In 1872 E.T. Bussell developed a knife-edged rim instead of a solid disk", the rim being "supported by a hub with spokes."

In 1875 J.K. Underwood "added a pair of carrying wheels between which the plow frame was mounted. The rudder flanged to prevent side-draft, and followed in the last cut furrow. The disk was mounted on a pivoted frame so that it could be forced down into the soil by means of a lever." Later on Underwood made various changes, and is said to have come "very close in principle to the present forms of the disk plow." He is also said to have been the "original inventor of the disk plow using two plow disks with adjustable axles."

In 1891 M. T. Hancock "secured a patent on a plow which marks the beginning of the period of acknowledged practical utility of the disk plow." The broadest claim of his reissued patent reads as follows: "In a rotary plow, the combination of the axle having an ordinary carrying wheel on one end and a staggered wheel on the other end, a frame work secured to said axle, and a plowing disk mounted on said frame work in the rear of said axle, and faced toward staggered wheel, whereby the sidewise pressure occasioned by the operation of said plowing disk is counteracted by the substantially direct resistance of said staggered wheel" (7, pp. 172-173).

"The development of the subsoil attachment with a pointed bar shaped like a share was invented by S.D. Poole, of Illinois, in 1895. This could be raised or lowered from two to ten inches."

As mechanical power was developed the gangs were made larger, sometimes as many as fourteen disks being used. To facilitate raising and lowering the disks an automatic power lift was invented. Two late "developments of the disk plow have been the doing away with the front wheel, and attaching the frame of the disk plow directly to the drawbar of the tractor. ***** The other development has been in attaching of the frame carrying the plow disks directly underneath the tractor between the front and rear wheel, which necessitated, in most cases, the adding of an extended front axle so that the tractor wheel could run in the furrow." ***** An interesting fact connected with changing the tilting of the disks at an angle instead of setting them vertically is that many of these disk plows of earlier days were made with wooden frames. Due to extreme pressure the wood would wear away, thus permitting the disk to slope back instead of standing vertical, in which position it did not work properly. The farmer would drive wedges in the wood to bring it back into normal shape. In one instance the wedges were driven in so that the disk stood at an angle, and the plow worked better that way. This led to a study of angles of disk setting, which resulted in the present angles being adopted (7, pp. 172-173).

A recent development in disk plows is that of the Wheatland, or Vertical Disk plow. This implement is a combination disk plow and disk harrow. The soil is not turned over as with a regular disk or moldboard plow, but is moved to one side with a stirring action. The vertical disk plow is said to have originated in Kansas, by farmers who saw the need for a plow which would mix wheat stubble and trash with the soil to prevent blowing of the soil and to retain the snow. Plows of this type were sold in large numbers for the first time about 1927.

As the slow-moving oxen of the very early days gave way to the swifter-gaited horse, so with the passing of years and the increase in size of farms the farmers desired some prime mover more rapid than the horse. To meet this demand efforts were made to devise a steam engine capable of pulling several plows, and, if necessary, other implements at the same time. Steam plowing was practiced in England before being introduced into the United States. There the plows were usually drawn through the soil by means of cables stretched across the field. As the cables unwound from a drum on one side of the field they were rewound on another drum on the opposite side of the tract being plowed.

Ellis and Rumely, (5, pp. 41-42) state that the "first recorded steam plowing engine in the United States was that of J.W. Fawkes" (of Pennsylvania). In 1858 he constructed what was called a plowing drag which is said to have been capable of pulling "eight plows at the rate of three miles per hour over original prairie sod." Other inventors were busy attempting to devise a satisfactory traction engine for plowing. "In 1871 the Royal Agricultural Society of England held trials extending over several months, in which the adaptability of all plowing and cultivating engines up to that time were thoroughly tested." Steam outfits built by John Fowler & Sons, of Leeds, were then in use. (5, p.42).

"From 1875 to the close of the century, development in American steam tractors was very rapid. Their utilization in plowing began almost as soon as they became self-propelling. Their serious use for this purpose, however, is not recorded until in the years just preceding 1890, when scattered operators began to use the most powerful threshing engines of that day for plowing, with only moderate success. The steam engine is a century and a half old, but the steam plowing engine of to-day (1911) is a creation of the twentieth century" (5, pp. 42-43).

The report of the Commissioner of Agriculture, for 1867 (18, p. 5) mentions two sets of English steam plowing machinery that had been sent to the United States, and stated that one was then in use in Louisiana and the other in Illinois.

The 1860 Census (20, p. xix) records that about the time of the invention of the Fawkes plow the Illinois Central Railroad Company tried to encourage the use of steam plows, and to that end offered a prize of \$3,000.

The steam engine for plowing was superseded by the gasoline or kerosene tractor, which is now a common source of power for farming operations in the United States. While the gasoline engine was successfully used for belt work in the last decade of the nineteenth century, it did not come into wide favor for drawbar work until some years later (5, p.76). L.W. Ellis (4, p. 8) states that the first gasoline tractor engine to be used successfully was put on the market about 1903. Some gasoline tractors were built and used a few years earlier, perhaps, but only on a limited scale. This type of tractor was smaller and lighter in weight, more easily handled, and required less attention than the steam traction engine. From the small beginning early in the twentieth century the number of tractors on farms in the United States had increased to over 920,000 and were found on over 851,000 farms, according to the 1930 Census (21, p.55). Since their introduction gas tractors have undergone many changes and improvements, and have to a considerable extent supplanted the horse as a source of farm power for field work in some parts of the United States.

From the crooked stick, powered by man's muscles, to the modern tractor-drawn plow is a long step. To quote Taylor (16, p.125), "The plow has blazed the way from the Garden of Eden to the magnificent farms of North America."

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EARLY PLOWS

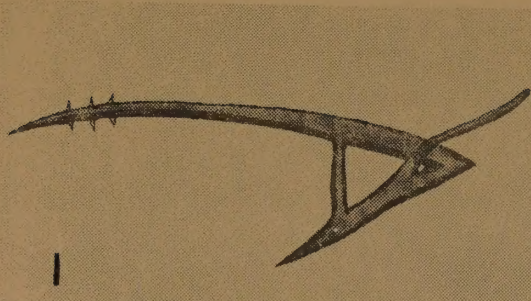
There is a great deal of interest in the early plows of the country. The early plow was a simple affair, made of wood and iron, and was used by the farmer to break up the soil. It was a simple machine, but it was the only one that was used for a long time. The early plow was made of wood and iron, and was used by the farmer to break up the soil. It was a simple machine, but it was the only one that was used for a long time. The early plow was made of wood and iron, and was used by the farmer to break up the soil. It was a simple machine, but it was the only one that was used for a long time.

FARM MACHINES, OLD AND NEW, IN PICTURES:

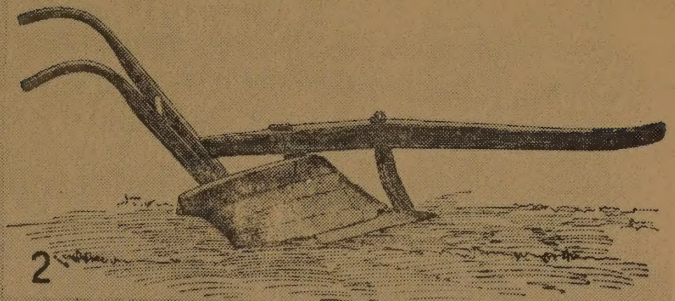
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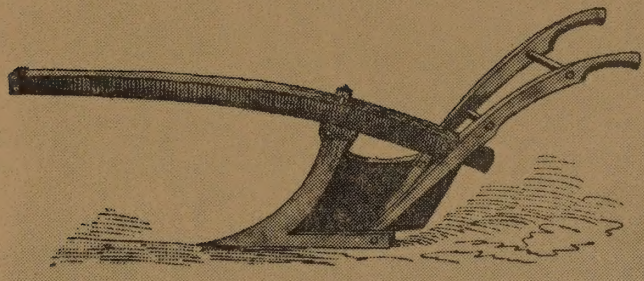
- Figure 1.- A primitive plow made entirely of wood.
- Figure 2.- An early colonial plow with metal strips fastened to a wooden moldboard. The plow is similar to the Foljambe plow on which a patent was obtained in England about 1720.
- Figure 3.- A plow with moldboard, share and landside made of cast iron in one piece. A United States patent of 1797.
- Figure 4.- The first cast iron plow with replaceable parts. A United States patent of 1814. A farmer could replace a broken or worn part with a new one.
- Figure 5.- A plow said to have been used by Daniel Webster about 1798.
- Figure 6.- Replica of one of the first steel plows, an American invention of 1837. This invention marked the beginning of the period of the modern plow.



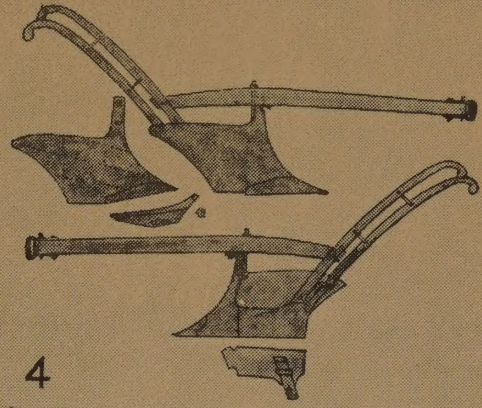
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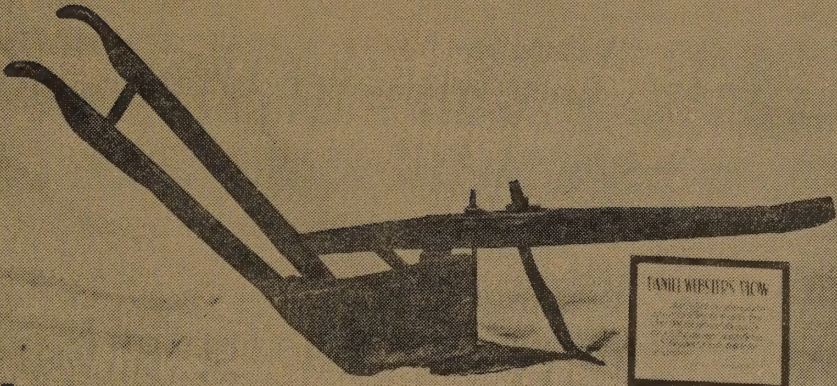
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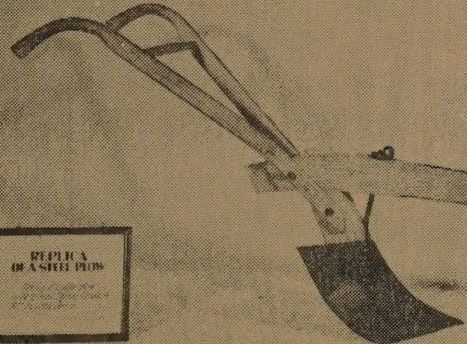


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5

DANIEL WILSON'S VIEW
This is a view of the plow as it was used by Daniel Wilson, who lived in the town of Danville, Vermont, in 1837. It is a simple wooden plow, with a curved beam and a rectangular blade. It is shown in a museum setting, with a sign next to it.



6

REPLICA
OF A STEEL PLOW
This is a replica of a steel plow, which was used by Daniel Wilson, who lived in the town of Danville, Vermont, in 1837. It is a simple wooden plow, with a curved beam and a rectangular blade. It is shown in a museum setting, with a sign next to it.

1837 - 1837
This is a view of the plow as it was used by Daniel Wilson, who lived in the town of Danville, Vermont, in 1837. It is a simple wooden plow, with a curved beam and a rectangular blade. It is shown in a museum setting, with a sign next to it.

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MODERN PLOWS

MODERN PLOWS

Figure 1.- A horse-drawn, riding plow, the development of which began about 1860.

Figure 2.- A vertical disk plow. The soil is not turned over as with a moldboard plow, but is moved to one side with a stirring action which leaves the stubble and trash protruding, which is helpful in preventing blowing and holding snow, thus conserving moisture. Plows of this type were sold in large numbers for the first time about 1927.

Figure 3.- A modern three-bottom, tractor-drawn plow.

